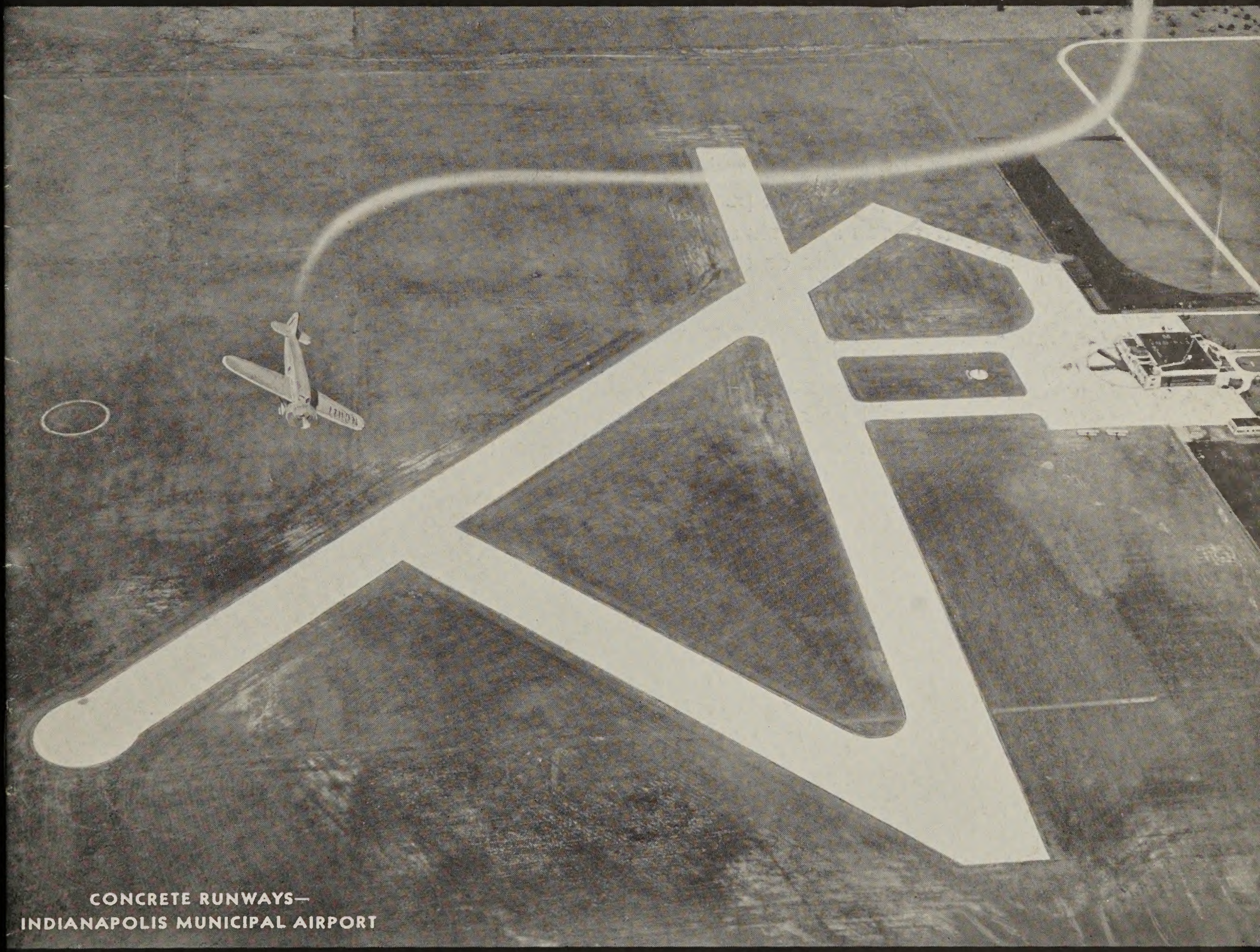
Concrete Makes a Modern Airport



CONCRETE RUNWAYS—
INDIANAPOLIS MUNICIPAL AIRPORT

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What Is a Modern Airport?

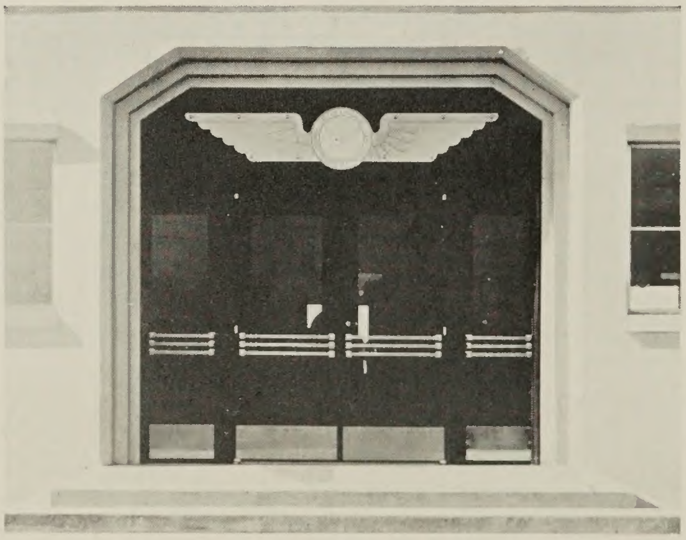
GETTING into the air and staying there was once a major problem of aviation. Now it is recognized that travel in the air can be no more efficient than service facilities on the ground, which must include not only permanent, maintenance-free runways and aprons but fire-safe, durable hangars, shops, administration buildings and passenger stations.

A modern airport is virtually an industrial city in miniature. By intelligent planning, airport builders are avoiding the wasteful and dangerous practices which created fire hazards, costly maintenance and uneconomical congestion in American cities.

The qualities of durability, strength, fire-resistance and adaptability to any shape or form, which make concrete the most practical medium for building modern cities, likewise make it the ideal material for building modern, permanent airports.

Only such airports as have the most modern facilities can hope to attract air traffic or expect to be on the routes of the great transcontinental airlines. The operation of an air field as a profitable enterprise also depends to a considerable extent on the cost of maintaining its facilities.

Runways, aprons, hangars, shops and other airport buildings of concrete will be attractive, permanent and enduring in all climates, with a minimum of expense for maintenance.



Entrance to Administration Building, Chicago Municipal Airport.

Day or Night
The Modern Airport Is a Busy Place

THE air transport industry has grown up. Flying is a precise business, with schedules to be maintained, payloads carried and passengers transported swiftly, safely and comfortably.

In the same degree the large modern airport, outgrowth of one which in an earlier day was the scene of only an occasional landing or take-off, is now filled with efficient, business-like activity. A liner circles the field, glides to a landing on the smooth concrete runway and taxies up on the concrete loading space. Passengers, mail and express are discharged in front of a concrete administration building with lines as clean and modern as that of the plane itself.

On the concrete apron in front of one of the fire-safe concrete hangars a smaller plane has been warming up. Now it taxies to the end of a runway and, at a signal from the dispatcher, the pilot "gives her the gun." After a surprisingly short run on the smooth, firm concrete surface, the plane rises and turns toward its destination. Another plane awaiting permission to land is signalled that the runways are clear.

All day long the modern airport is active. In winter, summer, rain or sunshine, its facilities must be available. At night there is little slowing up. And how welcome to the night pilot are light colored concrete runways, so easily seen against the otherwise black face of the earth!

For this kind of traffic, only the best is good enough. And the best, of course, is concrete. Attractive concrete administrative buildings; fire-safe hangars and shops; clean concrete aprons; firm, smooth, strong runways, make every operation safer. Costing but little more in the first place than less substantial construction, the annual cost is actually less.

You must build for this traffic. Although airports are busy today, the industry knows that we have seen but the beginning. And who can question it after remembering the development of the railroads, steamships, and more recently the automobile. Only a little over three decades have passed since the first flight at Kittyhawk. Compare the automobile industry of 1914, three decades after the first automobile was patented by Daimler, with the industry today.

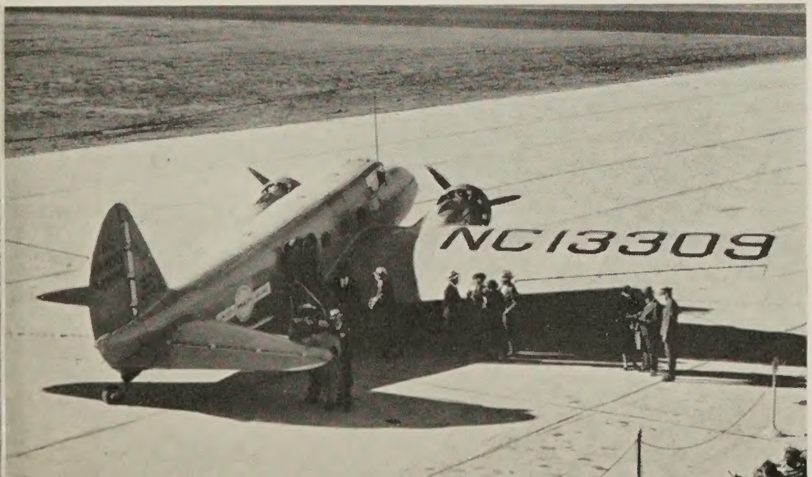
It is likely that, just as highway construction has been unable to keep pace with the growth of automobile traffic, improvement of ground facilities may lag behind progress in the air.

Industries in cities which have no air mail and express connections find themselves one to four days farther from their customers than are their competitors in other cities. The sure expansion of the air mail express service, bringing more of the nation within its reach, will increase the handicap of those who must depend on slower agencies. The cities which are ready will be included as expansion comes.

Have no fear of building too well. You may be sure that facilities barely adequate or too light for today's traffic and loads will be completely out of date before they have earned their cost. Build well for today with concrete and you will also have built for the future.

Passengers entering a transport plane on concrete loading apron at Chicago Municipal Airport.

Photo courtesy United Air Lines



Night scene at Los Angeles Municipal Airport.

Photo courtesy United Air Lines

Location and Layout of Vital Importance

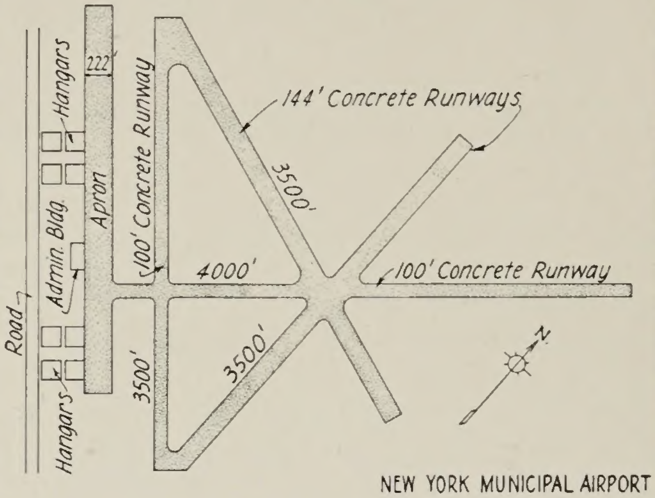
THE advice of a competent consulting engineer experienced in airport design should be obtained even before the site is selected. He will be informed regarding Department of Commerce requirements. He will be able to estimate for the various proposed sites the cost of grading and draining and of providing the necessary water, gas, electricity, sewers, telephone and telegraph. He will know whether the available area will permit a runway layout suitable to prevailing wind conditions.

The selection of too small a site, or one which precludes future expansion, is to be avoided. The development of brakes on airplanes, however, and the use of concrete runways on which flying speeds are more quickly attained make possible the use of areas which would be inadequate for the longer runways needed where concrete is not used. Shorter, wider runways and better planning combine to reduce excessive taxying and increase airport efficiency.

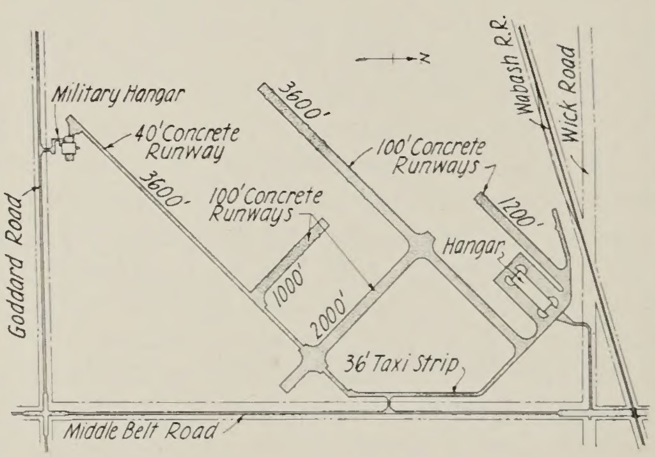
In larger cities, where distances are long and close-in sites are at a premium and frequently in smaller cities, dual airports may be advisable. A close-in field with good paved runways and a passenger-mail-express station, but with the very minimum of facilities for servicing planes, will require less space and reduce the time loss between the airport and the center of the city. A second field, lying farther out where space is available at less cost, will have equally good runways and station and will also have facilities for servicing, storage and repair of planes. Many private planes will not use the central airport. But it will save much time for passengers of the commercial lines and the air mail and express.

Direction and length of runways will depend on prevailing winds. Under all but most exceptional conditions at least two runways at approximately 90 degree angles are a minimum requirement. Three at 60 degree angles are preferred.

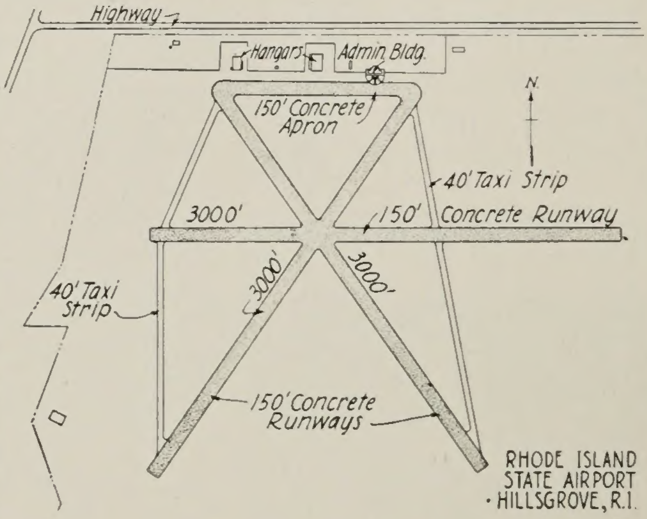
The typical layouts shown here give an idea of usual arrangements. The layout for any projected field should be designed to fit air conditions and reduce taxying to the minimum.



NEW YORK MUNICIPAL AIRPORT



WAYNE COUNTY AIRPORT
· MICHIGAN ·



RHODE ISLAND
STATE AIRPORT
· HILLSGROVE, R.I.

Concrete Buildings Best Suited to the Needs of Modern Airports

CONCRETE buildings for airports are as modern as the airplanes they serve. Attractive in appearance, fire-safe, permanent, sturdy; adaptable to any type of architecture, concrete is particularly suited to buildings with simple clean lines of the modern type, a type which is being widely used in airport architecture because it "fits" into the modern atmosphere of the airport.

All airport buildings should be of fire-safe construction. Serious fire hazard is always present, due to highly inflammable fuels and "dope" for wing surfaces. Destruction of planes by fire is an all too frequent occurrence. Concrete construction throughout will do much to reduce the fire hazard.

As a medium for architectural design, concrete is readily adaptable to any form. Buildings may be of either concrete masonry or monolithic concrete in which walls, floors and all structural parts are an integral unit. Concrete also offers unlimited possibilities for originality in exterior finish and ornamentation.

Note the interesting use of monolithic concrete for administration buildings at the Chicago Municipal Airport and the Shushan Airport at New Orleans shown below. Although ordinarily left with the plain architectural concrete surface, such a building may also be, as at the Shushan Airport, surfaced with stucco.

Concrete floors are easily kept clean, and are not injured by oil or gasoline. They must be designed as a pavement to withstand the loads imposed by heavy airplanes.

The following indicates the dimensions of hangars which must be provided in order to qualify for the indicated government rating for airports.

Minimum Inside Dimensions of Hangars Required for Government Rating
Hangar Dimensions

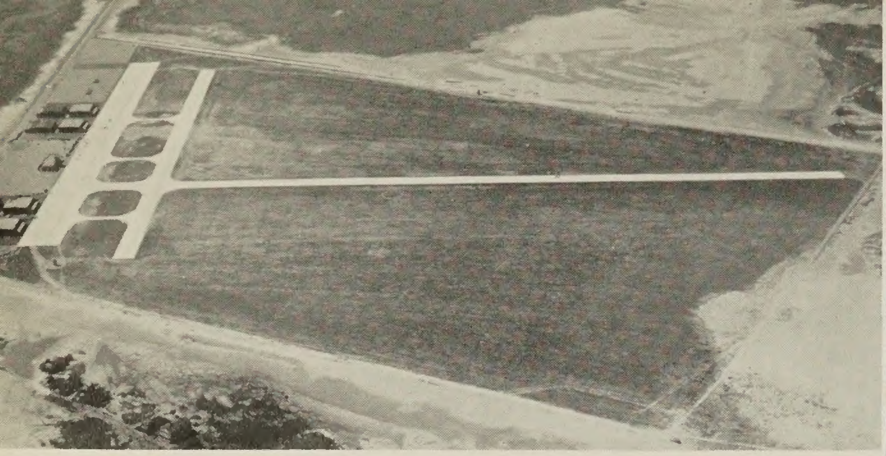
Airport Rating	Width	Length	Headroom Clearance	Clear Door Opening
A	80 ft.	100 ft.	18 ft.	80 ft.
B	60 ft.	80 ft.	14 ft.	60 ft.
C	50 ft.	60 ft.	12 ft.	50 ft.

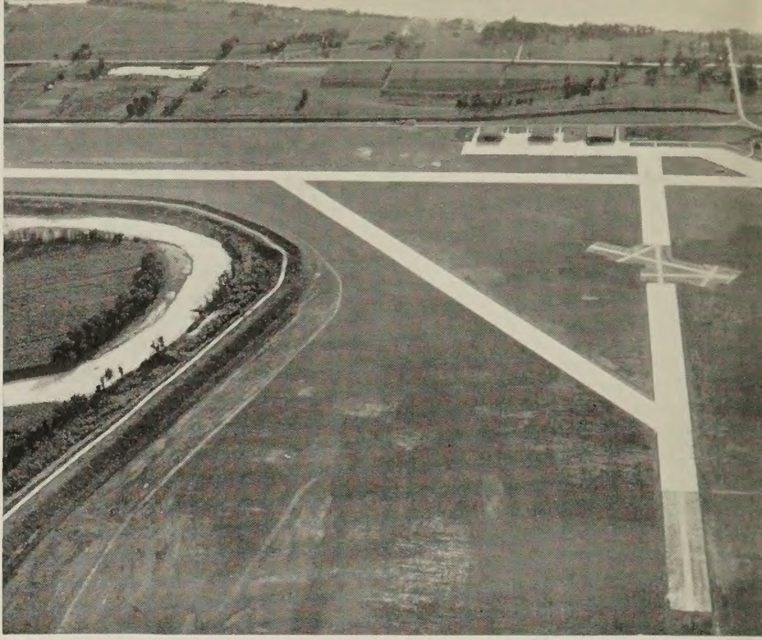
If an A rating is desired, provision must be made for heating the hangar in localities where freezing temperatures are experienced. Facilities for heating oil and water are required for either A, B or C rating.

Make your airport buildings attractive. To incoming travelers the airport is a city's front door. Its most prominent visitors will get their first impression of your city at the airport. Let it be an impression of attractive, sturdy, substantial construction.

Night view of Administration Building, Shushan Airport, New Orleans. Building is monolithic concrete with exterior finish of ornamental stucco.

Monolithic concrete Administration Building at Chicago Municipal Airport.





Above—Aerial view of concrete aprons and runways at Floyd Bennett Airport, Brooklyn, N. Y. Extensive additions to these runways are being made.

Photo by Arnold Photo Syndicate

At right—Clean, smooth and highly visible, these concrete runways put the Lunken Airport at Cincinnati in the front ranks.

Photo by Fairchild Aerial Surveys, Inc.

Concrete Runways of Operating

CONCRETE runways are a necessity in the up-to-date airport. This is true not only from the standpoint of handling the heaviest of transport planes in all weather but also to reduce the distance required for take-offs and to lessen the hazard from stones and dust blown by propellers.

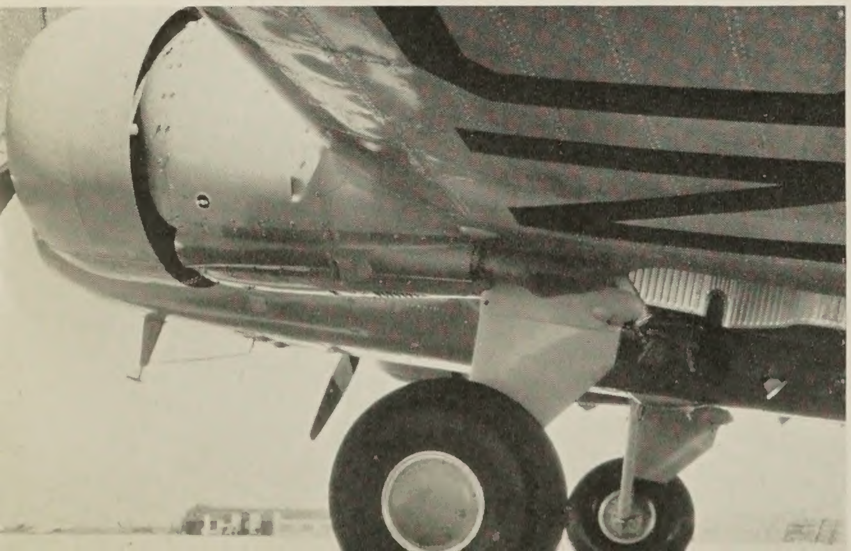
Some sort of surfaced runways are imperative if the field is to be satisfactory for use at all times. Halfway measures in surfacing are unsatisfactory and costly.

Loose Material a Danger

Runway surfaces should be dust-free to prevent the air stream from propellers from stirring up dust to a dangerous degree. Loose particles of gravel, crushed stone or cinders are often picked up by the air currents from the propeller with such force that plane fabrics are damaged and the eyes of passengers and crew endangered.

It takes good pavement like the concrete taxiways in the Chicago Municipal Airport to support the wheel load of the big fellows like this one.

Photo courtesy United Air Lines



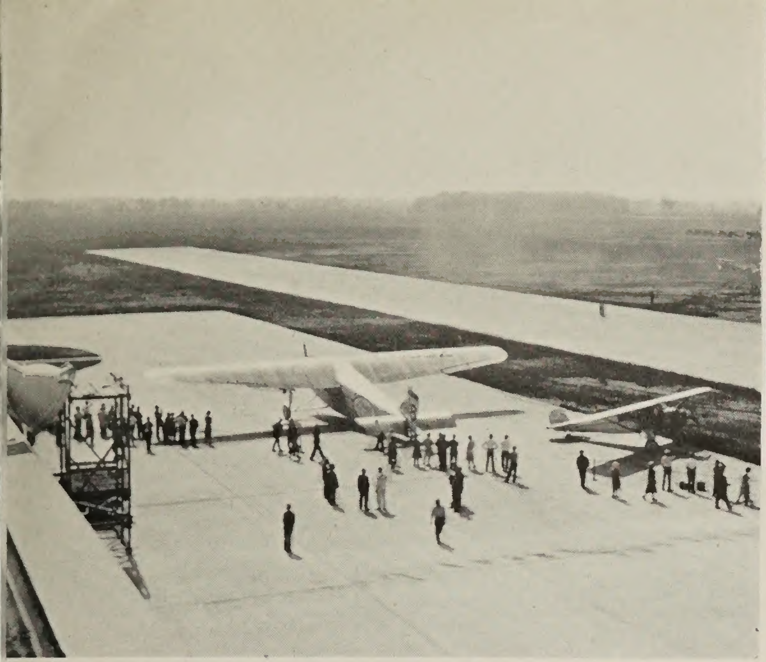
The following is quoted from the Report of the Joint Committee on Airport Drainage and Surfacing, representing the Aeronautics Branch of the Department of Commerce, the American Engineering Council and the American Road Builders Association:

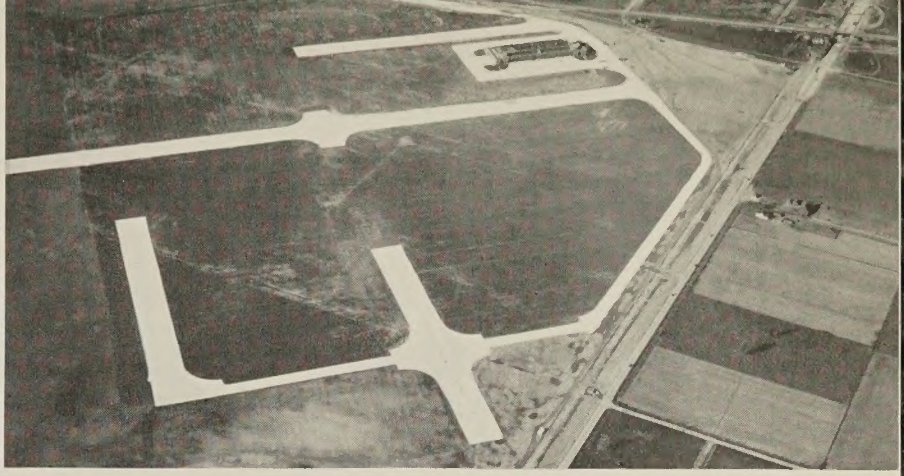
> "Runways that are not bound with some kind of cement-like material are objectionable largely because of the action of the propeller in picking up particles with consequent damage to the propeller itself and to the fabric covering of the airplane."

The service required of a runway pavement differs in no material way from that required of a highway carrying high-speed heavy traffic. Modern planes in everyday use on the various airlines range up to over 18,000 lbs. gross weight.

Strong Paving Necessary

A plane landing on a runway strikes it with a blow greater than the weight of a stationary plane. The best information indicates that the total force is from one and a half to two and a half times the weight of the plane and may in some instances be even greater. On smooth





Left shows the wide concrete aprons and runways which make the Wayne County Airport at Detroit among the best in the country. Above is general aerial view of Wayne County Airport.

Photo by Kalec, Inc.

Reduce Cost Modern Airport

landing surfaces, such as concrete, only one heavy blow is struck. But if the surface is uneven, bouncing will result and the second or third blow may be even greater than the first. In landing and taking off, an airplane's weight rests on only two wheels. Each wheel of a large plane will exert a landing pressure which may exceed 30,000 lbs., and will usually be between 13,000 and 22,000 lbs.

Concrete Meets Requirements

Pressures such as these require pavements of great strength. Concrete meets all the requirements for airport runways, according to H. E. Boler, Safety Engineer, Wayne County, Michigan, Road Commission, in charge of the Wayne County Airport. In an address at the 16th Annual Conference on Highway Engineering of the University of Michigan, Mr. Boler said:

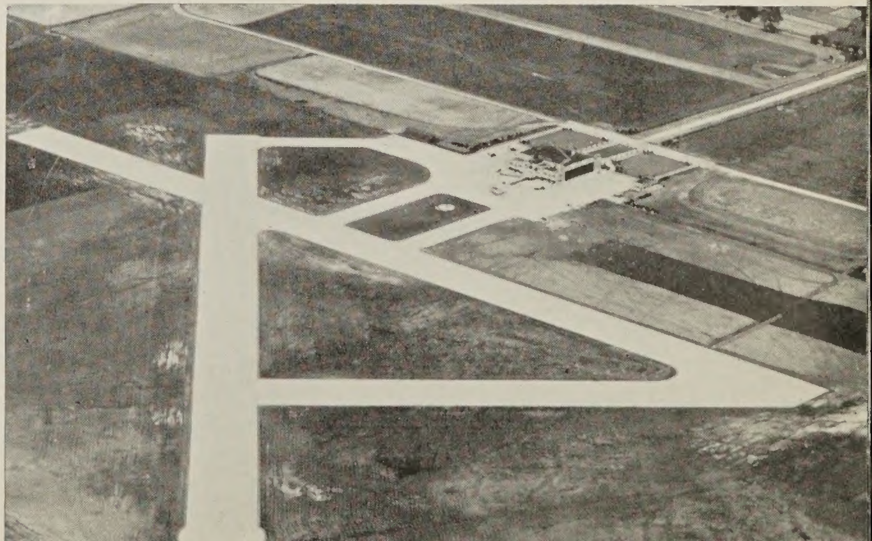
> "An ideal hard surface to be used for runways should have the following characteristics: economical initial cost, low maintenance cost, non-skid properties when wet, visibility at night, freedom from dust, a smooth rigid surface for taking off at high speed, and the durability to withstand the shock of impact when a landing is made with a heavy load. Concrete comes nearer to meeting all these requirements than any other standard road material."

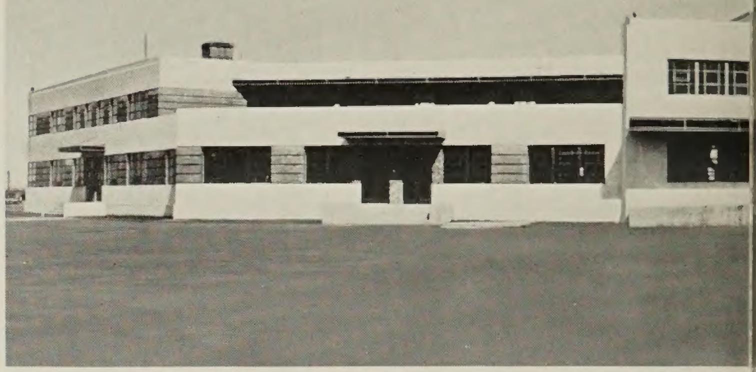
Firm Landing Surface Needed

No pavement surface which is firm enough to carry airplane loads can be soft and pliable enough to cushion the blow of a landing plane. A soft and pliable surface, sometimes erroneously referred to as a "resilient" surface, could hardly permit the wheels to sink into it more than a quarter to a half inch. That would be insignificant compared with the "take-up" of 12 inches or more provided for in the tires and shock absorbers of the plane. But if each plane cut only a fraction of an inch into a pliable surface, it would soon become rough and unstable, wholly unfit for safe landings.

Pilots have no difficulty in seeing these concrete runways at the Municipal Airport in Indianapolis.

Photo by Fairchild Aerial Surveys, Inc.





Reinforced concrete Administration B

Durability Comes First

This question is discussed in the Joint Committee Report, previously mentioned. The following is quoted from that report:

> "A pliable surface, by its very nature, cannot be resilient. A pavement that is at the same time stable and durable, sufficiently flexible to be of material value from a shock absorbing standpoint, and that offers a grip for a tail skid, has not yet been built.
>
> " . . . There are no pavements pliable and flexible and at the same time stable and durable."

Formerly, it was thought necessary to have a surface which offered a grip for the tail skid in order to stop a landing plane in a reasonable distance. Today, all but the very smallest planes are equipped with brakes and the tail skid has been replaced with a wheel so that this is no longer a factor in runway surfaces. The few planes that still use the tail skid can land on the turf alongside the runway. If they should land on a concrete runway, the only damage would be to wear out the tail skid more rapidly; there would be no damage to the concrete. But tail skids may do much damage to less firm surfaces.

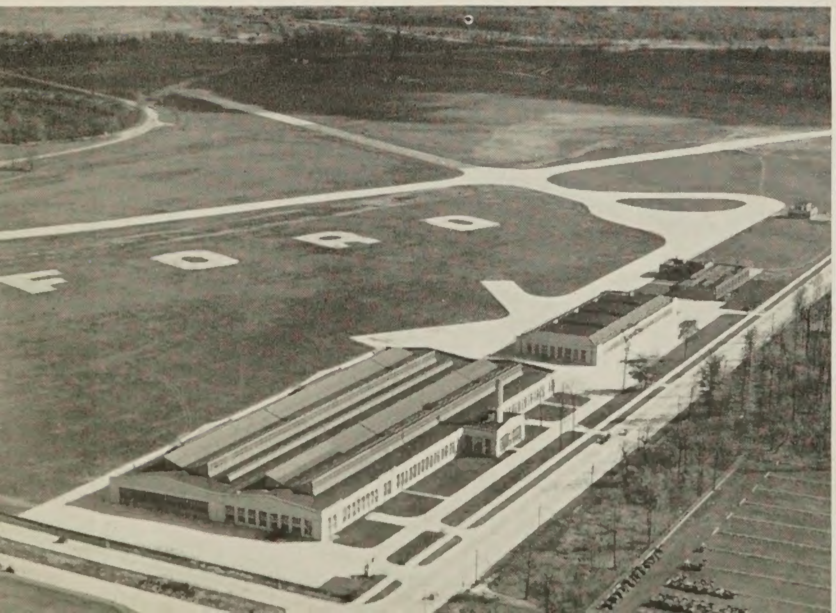
Ideal Surface Texture

An ideal surface texture is one which is rough enough to prevent skidding when wet but smooth enough to prevent excessive wear on tires when landing. The wheels of a plane moving 60 miles an hour or more are not rotating at the instant it makes contact with the runway surface. The type of non-skid surface used on some highways would do serious damage to the tires before rotation could be established. Concrete, on the contrary, can be given exactly the desired degree of surface roughness by proper control of the finishing operations.

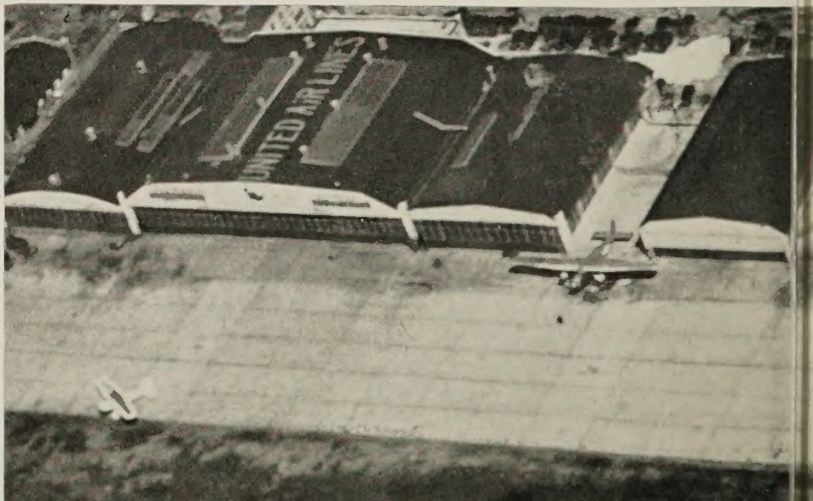
Water Must Drain Away

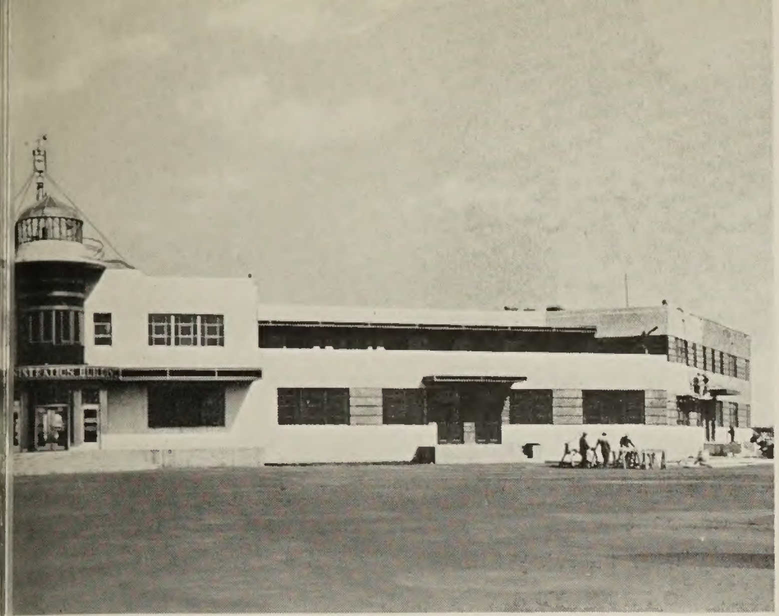
Both in landing and in take-off, planes move at such high speeds that irregularities in surface subject them to excessive shock or impact, damaging to the plane and annoying to its occupants. It is also essential that the crown be held to a minimum to prevent the airplane from swerving from the runway. At the same time the crown must be such that water will quickly drain away at all times and especially in freezing weather.

Aerial view showing concrete runways and taxi strips at Ford Airport, Dearborn, Mich.



Aerial view of concrete aprons and





at Newark, N. J., Metropolitan Airport.

Concrete Remains True

Not only will water run off smooth concrete with less crown than is necessary if a rougher type of surface were used but the accuracy with which concrete may be placed and finished permits the use of lower crowns. That same true surface, so readily produced in a new concrete pavement, remains true.

Concrete pavements for airport runways, taxiways, aprons and hangar floors may be designed by use of rational principles developed for roadway pavements. Given the safe bearing power of the subgrade and the wheel loads which the pavement will have to carry, the design requires the use of simple formulae whose accuracy has been tested in laboratory and by practice. There is no guesswork in the design of concrete pavements.

These formulae are given and their use explained in an Information Sheet "Design of Concrete Runways for Airports" which should be studied in connection with the booklets "Concrete Road Design Simplified and Correlated with Traffic"* and "Concrete Pavement Manual"* before undertaking the actual design of pavements for runways, taxiways, aprons and floors.

According to the best engineering practice, expansion joints are as necessary in concrete runways as in roads and streets. Such joints should be placed in the same manner as they would be in highway or street construction.

Makes Take-off Easier

Concrete runways with their low resistance to traction enable planes to acquire flying speed with a shorter run. The "Bremen," with its full load for the flight to America, took off the concrete runway at Dessau, Germany, with a run of only 1,800 ft. The same plane, with decreased load, required a starting run of 4,750 ft. on its next take-off from the rolled cinder runway at Baldonell, Ireland. Except for a few airports where planes are expected to take off with extra heavy loads or for very long non-stop flights, concrete runways of 3,000 ft. length should be ample.

The width should be at least 100 ft. and, at important fields, 150 ft. width is preferred. If runways of less width are constructed as the initial step, they should be arranged so that they may be widened to at least 100 ft. without disturbing the layout.

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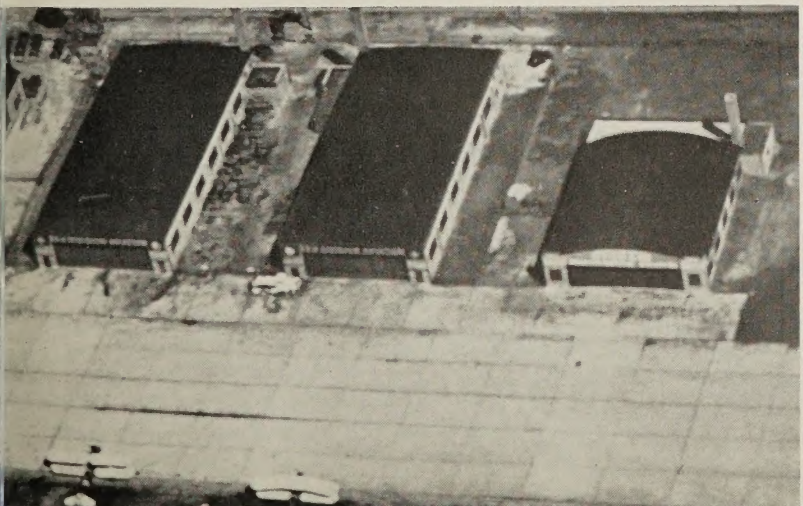
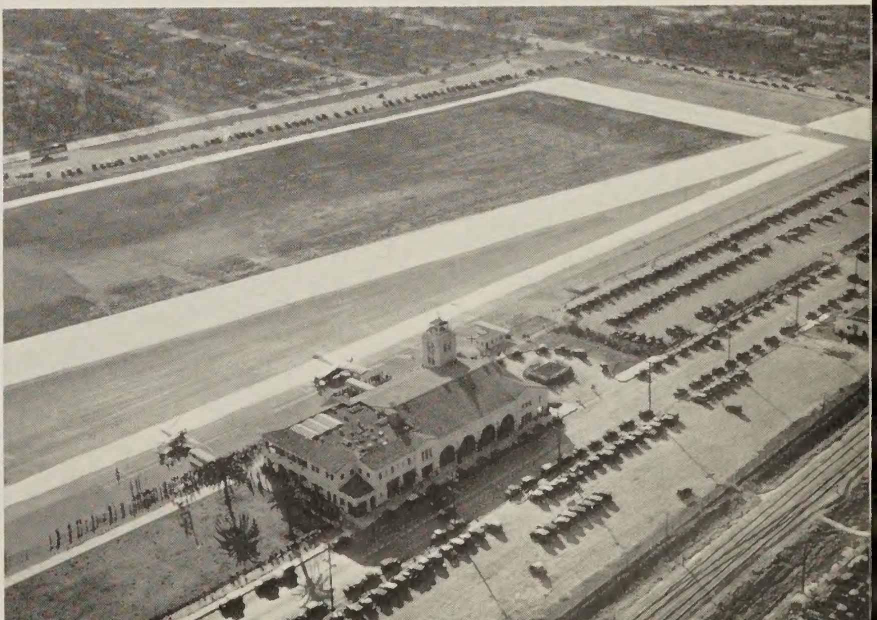
*Copy on request at any Portland Cement Association office.

strips at Chicago Municipal Airport. *Photo courtesy United Air Lines*



Aerial view of concrete runways and buildings at Grand Central Airport, Glendale, Calif.

Photo by Fairchild Aerial Surveys, Inc.

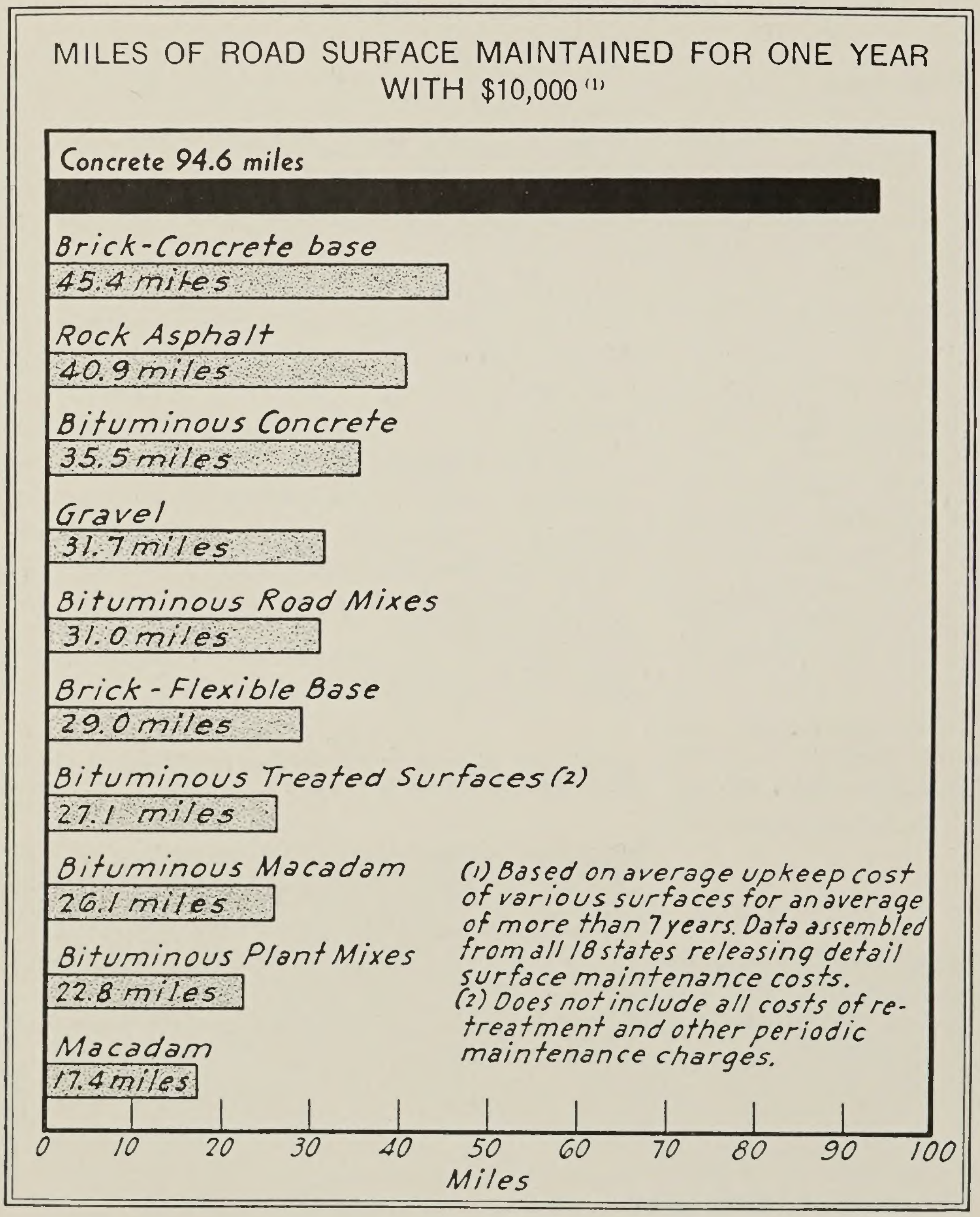


Concrete Saves in Maintenance Costs

CONCRETE runways will pay for themselves in a few years by what they save in maintenance expense. This saving continues year after year. Any corporation, public or private, which fails to select a paving material with a low maintenance cost is likely to be facing unexpectedly large expenditures for repairs, retreatments or patching in order to prevent deterioration of comparatively new runway surfaces.

If the runways are of concrete, such a situation will be avoided. Authorities of airports which have used concrete runways agree that they have required little maintenance. But the best evidence of the cost of maintenance of various pavement types is from state highway records. Records are available on thousands of miles of all types of pavement, on all types of subgrades, under all climatic conditions. Although concrete has been generally used on roads carrying the heaviest traffic, its average maintenance costs have been far lower than those of other commonly used types of construction, less than half its nearest competitor.

Build with Concrete! Unless your budget will stand heavy maintenance expenses you cannot afford to do otherwise!



(1) Based on average upkeep cost of various surfaces for an average of more than 7 years. Data assembled from all 18 states releasing detail surface maintenance costs.
(2) Does not include all costs of retreatment and other periodic maintenance charges.

Concrete Runways for Easy Visibility

GOOD visibility of landing areas under all conditions is essential to safe flying. Concrete runways and markers are more easily seen from the air both day and night than are runways of darker material. Concrete runways are clearly visible in the daytime. Even under adverse weather conditions concrete may be seen farther than any other type of runway surface, but at night or in the dusk of evening the advantage is even greater. Grass and other green vegetation are enough darker than concrete to give a good contrast in the daytime, but at night they become almost or quite black, even under artificial illumination. Concrete then offers a striking contrast, stands out clearly against the otherwise dark surface of the earth, while black or dark colored pavements blend in with dark vegetation and can be seen only with difficulty.

Why is concrete so much more visible? Because we see objects by the light which strikes them and is reflected back to our eyes. And actual measurements by accurate scientific instruments in the hands of skilled impartial observers have shown that concrete reflects much more light, 6 to 10 times more*, than is reflected by commonly used black pavements. This means that concrete is 6 to 10 times as "bright" under the same illumination, according to engineers of the General Electric Company. Or it means that it will be 3 to 5 times as bright with only half as much illumination as is used on the black pavement. And the contrast between the concrete and the adjacent turf, which is the really important factor, is even greater.

Thus, it costs less to illuminate concrete runways. There is a saving in initial cost because cables, transformers, lighting units may be smaller. There is a continuous saving in current to operate the lights.

Not only does concrete have a high reflection factor but it has the highly desirable matte surface, diffusing the light which strikes it. Light reflected from concrete is visible from all directions. This is in distinct contrast to the light reflected from specular (shiny) surfaces which may be glaring in one direction but of such low intensity as to be almost invisible in all other directions.

Airplanes approaching and landing from all directions will appreciate the diffused brightness of concrete runways, clearly seen without glare from every angle of approach.

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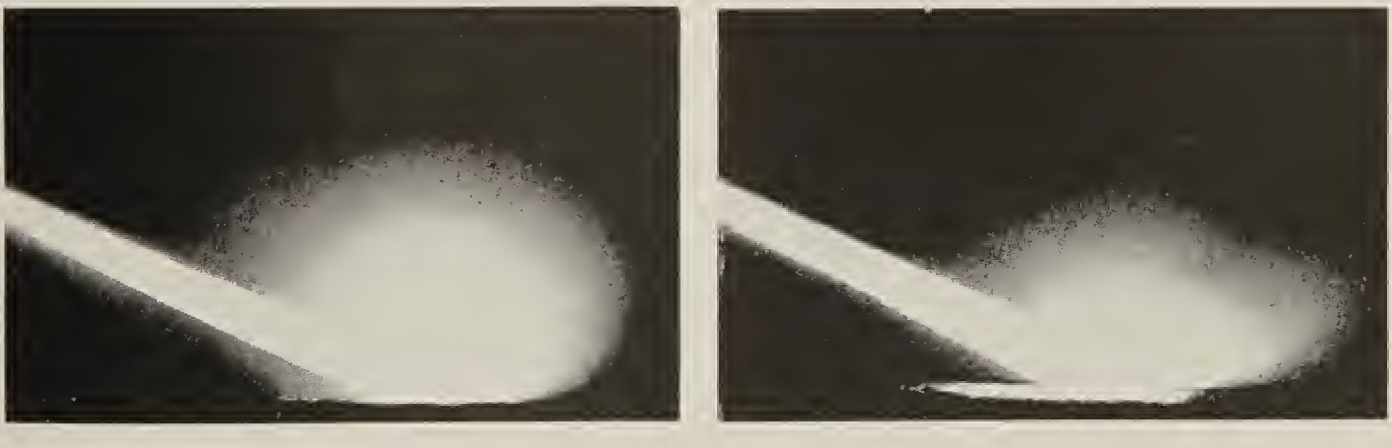
*Under special conditions, approaching 20 times more.

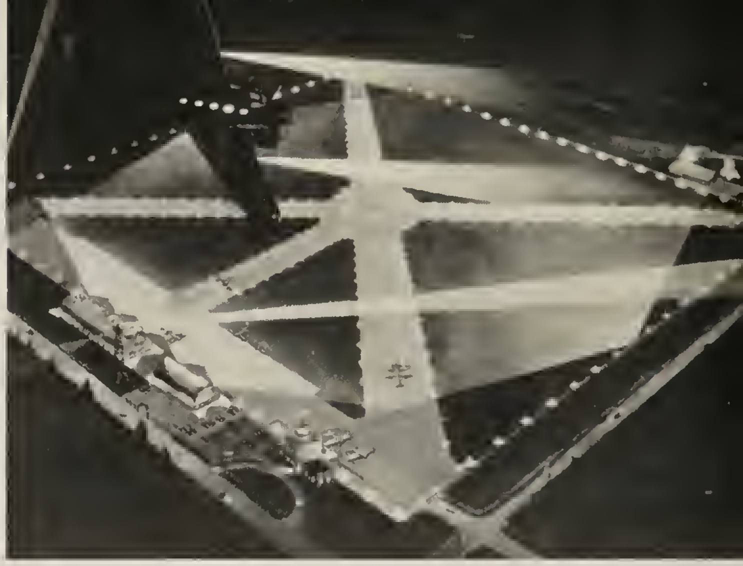


Dry concrete

Wet concrete

Tests by the General Electric Laboratories show that, wet or dry, concrete is superior to other paving surfaces for safe lighting. On concrete, light beams are diffused without blinding glare.

What Famous Flyers Say About Concrete Runways



A fanciful picture, but it's the pilot's ideal for a landing field at night—plenty of concrete runways.

Courtesy United Air Lines

CONCRETE runways have the enthusiastic approval of pilots, according to the public statements of some of the acknowledged leaders. These famous flyers, who have earned their leadership by difficult achievements in the air, all express a preference for concrete runways and give sound reasons.

Admiral Richard Evelyn Byrd, U. S. Navy *(Retired)*, closes his article on "Air Transatlantic Flight" in the National Geographic Magazine, September, 1927, by including "provide large concrete take-off and landing fields" among his list of things which "must be done now." In a signed article, in the Boston Herald, July 4, 1927, Admiral (then Commander) Byrd said: "The field, it seems to me, should be made of concrete or some material unaffected by water."

Colonel Chas. A. Lindbergh, in a signed article in the Chicago Tribune, Nov. 11, 1928, entitled, "What America Needs Is More Good Airports," after discussing the dust nuisance, said:

"Concrete aprons around the edge of the field, on which most of the taxying can be done, and concreted or other artificially hardened runways will reduce this trouble considerably. On several large airports concrete aprons have been built along the side and the planes are warmed up there."

Clarence D. Chamberlain, in a letter, April 16, 1930, has said:

"I have made several test landings on the concrete runways at Floyd Bennett Field and am very enthusiastic about them. One day I had seven passengers up in my new Crescent plane and landed on the runway holding my tail skid off so as not to make any noise and then taxied into position. We had rolled nearly one quarter of a mile before someone looked out and exclaimed: 'Why, we are on the ground!' They were so busy talking about the flight, and the runway being so smooth, that they didn't realize we were down.

"Except in a very few instances, concrete or some other form of hard runway is necessary if the field is to be used all year round."

In a newspaper interview in Chicago, Nov. 12,

At left—This huge hangar at the Curtiss-Wright Airport, Baltimore, Md., has walls of concrete masonry with an exterior finish of stucco.

Monolithic concrete hangar and concrete aprons at Hamilton Field, California, a training field for U. S. Army flyers.

Concrete Administration Building at Union Air Terminal, Los Angeles, Calif.

Photo courtesy United Air Lines

1927, Mr. Chamberlain said: "The airport of the future will probably be concrete to assure pilots a smooth runway for landing and taking off."

Captain Eddie V. Rickenbacker, in an address before the Nayasset Club of Springfield, Massachusetts, and reported by the Associated Press, March 29, 1930, predicted that the airport of the future will be concrete. He urged that municipalities contemplating the development of flying fields take into consideration this need of a permanent flat surface.

"Smiling Jimmy" Mattern, round-the-world flyer, cabled from Omsk, Siberia, to the Floyd Bennett Airport, June 7, 1933: "Will be glad to get on concrete runways again."

S. D. Welch, crack test pilot, was quoted as follows in the Washington Post, March 23, 1929: "If aviation is to succeed, planes must move on schedules just as regular as those of the railroads. It won't do to tell a passenger that the plane can't take off because the field is soggy. Nor will the passenger stand for a plane getting stuck in the mud or turning over because of the mud. In my opinion all these problems are solved by these concrete runways."

John H. Livingston, winner of the 1929 National Air Tour, in a signed statement, Feb. 4, 1930, said: "Concrete has proved itself the best and safest material for an all-year, all-weather surface both for landing and taking off."

Cy Caldwell, aviation authority and writer for the Aero Digest, in an article in that magazine, January, 1929, describing a landing at the Ford Airport, said:

"That concrete runway is the finest thing I have yet taken off of or landed on * * *."

Major R. H. S. Mealing, Director of Civil Aviation, British Air Ministry, in an article in "The Canadian Engineer," July 2, 1929, said:

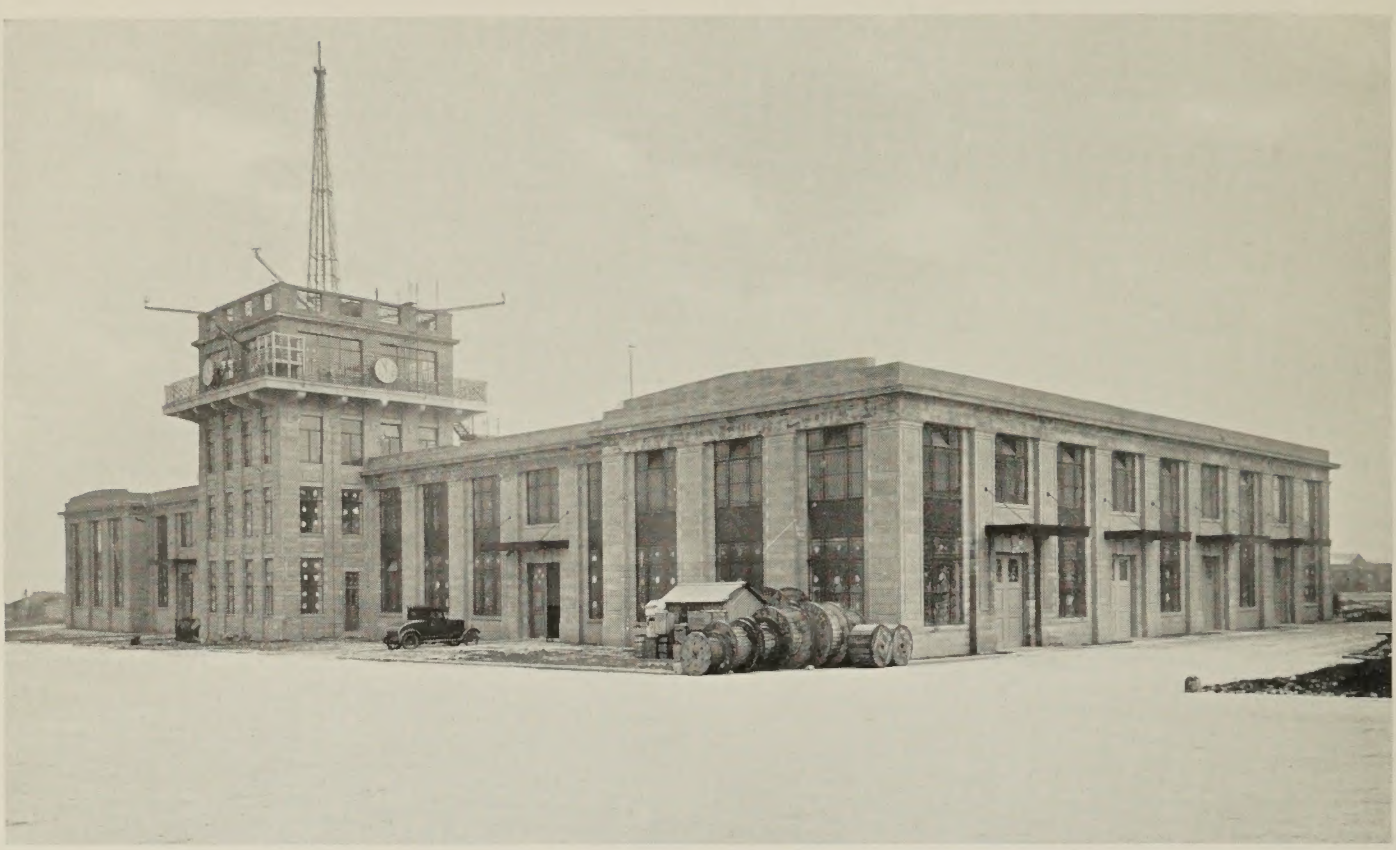
"I have no doubt that one day the whole surface of airports will be concreted over and that time is not so far distant as one might think. When we have all airplanes fitted with brakes and tail wheels instead of tail skids, a concrete surface affords every advantage and no disadvantages."

As has been previously indicated, brakes and tail wheels are now almost universally fitted to new planes. Cy Caldwell, quoted above, has also said: "Today a tail skid is as obsolete as the hand brake on a street car!"

With this approval of flyers added to that of the airport authorities who like it because of its low maintenance, ease of lighting, etc., concrete just about becomes the unanimous choice of all concerned with the aviation industry!

At right—Concrete hangar and office building at Los Angeles Municipal Airport.

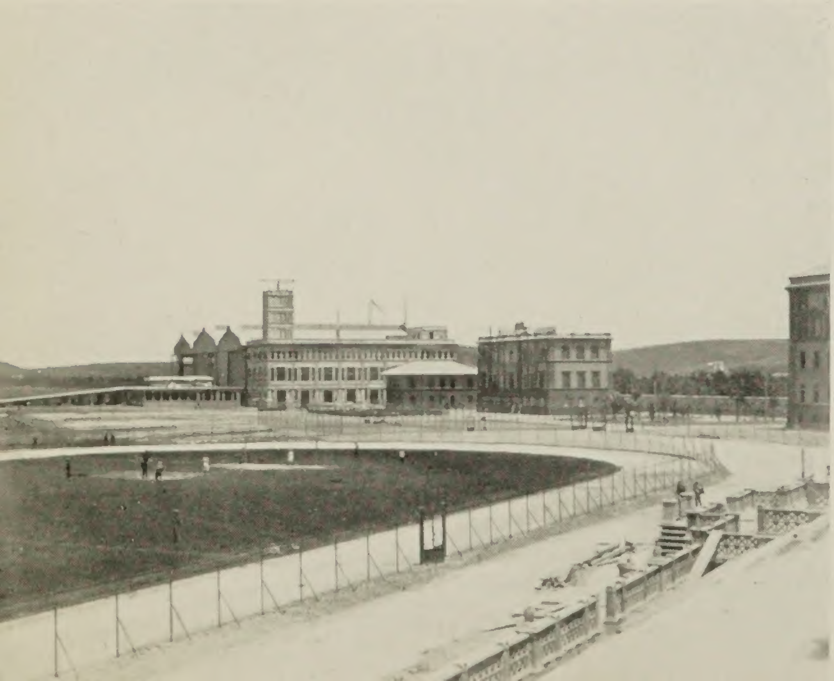
Below—Plenty of concrete around this fire-safe hangar at Maxwell Field, Montgomery, Ala.



The Administration Building of the Croydon Airport in England is built of cast stone. Extensive aprons are of concrete.

Europe's Finest Airports Use Concrete Extensively

A long concrete ramp leads to the concrete hangars at Littorio Airport, Rome, Italy. Administration Building and hotel are of cast stone.



A FEW years ago America looked with envy upon the air services connecting principal European cities. Today American commercial aviation and the air mail are definitely in the position of world leadership. American built planes and motors are second to none.

Many of the American airports have kept up with the progress. Europe has no finer airports than some that have been built here. But the names of Croydon, Le Bourget and Tempelhof still are impressive even in America.

At these great airports and many others concrete has been used extensively. The first known example of concrete runways was at the Taliedo

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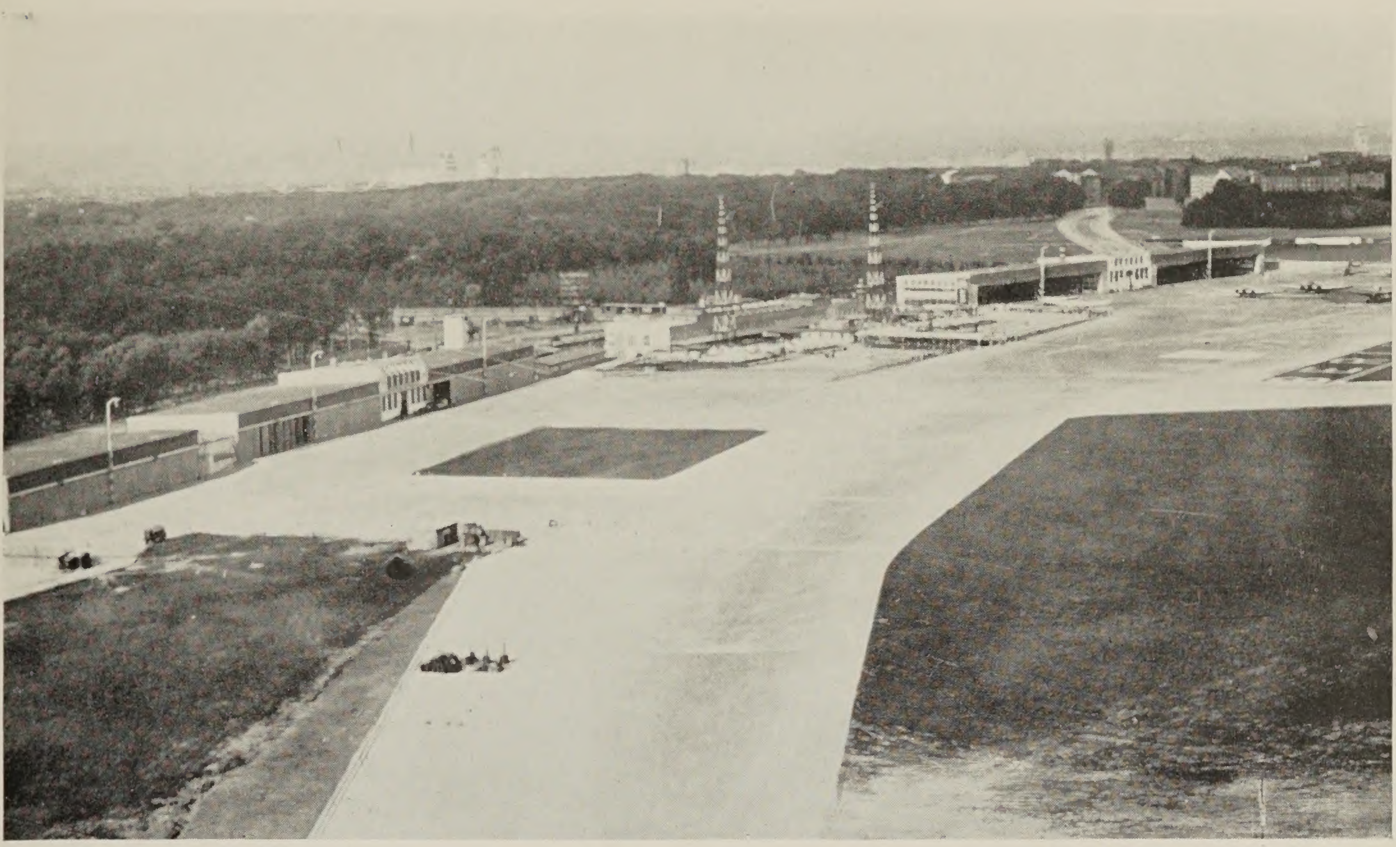


Huge areas of concrete are used for planes at the Tempelhof Airport, Germany.

Airport at Milan, Italy. A runway 230 ft. wide and 1,150 ft. long was built during the World War to serve planes being delivered to the French border. Still in service, it has been greatly extended as the development of aviation required enlargement of the field.

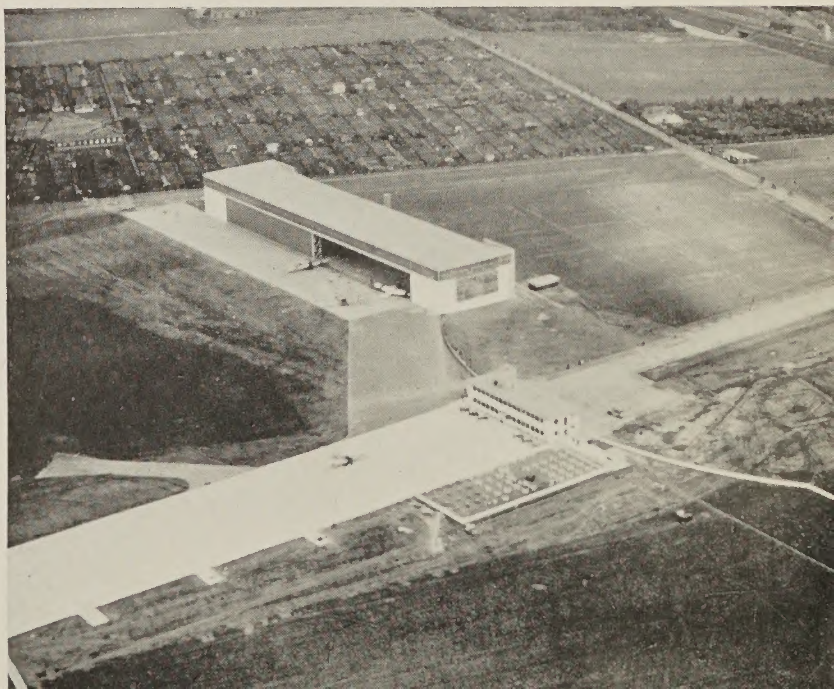
Large Areas of Concrete

Large areas of concrete aprons are in use at Croydon, Le Bourget and Tempelhof. The concrete runway at Dessau, Germany, previously mentioned as the starting point of the transatlantic flight of the "Bremen," is 2,460 ft. long. Many others are in use, especially in Germany and Holland.

Not only has concrete been used for pavement but the European airports have used it generously in airport buildings. The hotel and administration building at the Littorio Airport at Rome are of precast concrete. A long concrete ramp, sometimes used for take-off, leads to huge concrete and steel hangars. Croydon has a concrete administration building and an elaborate layout of concrete hangars and concrete aprons. Several European airports have built hangars with reinforced concrete roofs, especially recommended for their insulating value.

European airport officials have recognized the value of permanent concrete construction. Leaders in American aviation are also building for the future, building of concrete.

Concrete runways have been used for years at the Halle-Leipzig Airport, Germany.



Here's Literature Helpful in Planning Airport Improvements

ARCHITECTURAL CONCRETE
Concrete Masonry Construction for Enduring and Firesafe Structures
CONCRETE FLOORS How to Build Them
CONCRETE PAVEMENT MANUAL
Design of Concrete Runways FOR AIRPORTS
ROAD MAINTENANCE COSTS
CONCRETE SIDEWALKS
CONCRETE ROAD DESIGN
CONCRETE ASHLAR WALLS

Write today to the Portland Cement Association for up-to-the-minute information on how to get the best results from concrete in airport construction. Any of the literature listed below will be mailed without obligation.

Design of Concrete Runways for Airports

Contains technical data on construction of runways.

Concrete Road Design

How to design a pavement to carry any given load, whether truck or transport plane. 72 pages.

Road Maintenance Costs

Airport executives who wish to avoid excessive maintenance expense will wish to see these official records of the cost of maintaining roads of various materials.

Concrete Pavement Manual

Describes the best construction and design practice for roads, streets or runways. 72 pages.

Maintenance of Concrete Pavements

Describes easy, simple and inexpensive methods of pavement maintenance. 16 pages.

Beauty in Walls of Architectural Concrete

A 36-page pictorial magazine describing the outstanding current achievements in monolithic concrete buildings. Gives technical details on how beautiful exterior effects are obtained.

Concrete Floors—How to Build Them

Packed full of helpful information to aid in getting durable floors for hangars and shops or any airport building.

Concrete Sidewalks

Airports need sidewalks. This 12-page booklet gives the best methods of construction.

Concrete Masonry Construction

Tells how to get durable, fire-safe construction with precast masonry units. 48 pages.

Concrete Ashlar Walls

How to get beautiful textures and finishes for walls of administration buildings or other airport structures. 16 pages.

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A National Organization to Improve and Extend
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